



UNITED STATES PATENT AND TRADEMARK OFFICE

#12

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/653,541 | 08/31/2000 | Mark Tuttle | M4065.0363/P363 | 4204 |

24998 7590 08/28/2002

DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP
2101 L STREET NW
WASHINGTON, DC 20037-1526

EXAMINER

HO, TU TU V

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 08/28/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

RC

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 09/653,541 | TUTTLE, MARK | |
| | Examiner | Art Unit | |
| | Tu-Tu Ho | 2818 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) ____ is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-40 and 64-86 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

This is in response to Applicant's Amendment filed 05 August 2002.

Note that the figures and reference numbers referred to in this Office Action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. §102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371© of this title before the invention thereof by the applicant for patent.

2. Claims 1-2, 32, and 70 are rejected under 35 U.S.C. §102(e) as being anticipated by Wang et al. U.S. Patent 5,977,626.

Regarding claims 1,2, and 70, Wang et al. disclose in Figure 2 and respective portions of the specification an integrated circuit structure comprising:

at least one integrated circuit chip 22 containing structures which may be affected by external magnetic fields, said integrated circuit chip having a front surface and a back surface, said front surface being supported by a chip carrier 20; and

a magnetic field shielding material 32 (heat spreader) in contact with said back surface of said chip (see column 4, lines 28-31 for a statement that the heat spreader improves EM shielding effect).

It is evident that the structure also discloses a method as claimed in claim 70.

Referring to claim 32, Wang et al. disclose in Figure 2 and respective portions of the specification an integrated circuit chip 22 containing structures which may be affected by external magnetic fields, said chip comprising a magnetic field shielding material 32 in contact with a surface of said chip.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-2, 9-12, 19-22, 32, 39-40, 64-65, 70-74, and 76-78 are rejected under 35 U.S.C. §103(a) as being unpatentable over prior art (figures 1 and 2 of the present application) in

view of Wang et al. U.S. Patent 5,977,626 (patent '626) or Cassarly et al. U.S. Patent 4,433,886 (patent '886) and further in view of Higuchi et al. U.S. Patent 4,835,598 (patent '598).

Referring to claims 1-2, 9-12, 19-20, 32, 39-40, 64, 70-71, and 77-78, a conventional flip-chip device as disclosed in Figures 1 and 2 of the application comprises:

a die/semiconductor chip 30 electrically connected to a die/semiconductor chip carrier 20, said die/semiconductor chip further comprising a magnetic random access memory device; and
a printed circuit board (not shown but could be coupled to said die carrier) electrically connected to said die carrier.

However, in the conventional flip-chip structure, the die is not in contact with a first layer of magnetic field shielding material and the printed circuit board is not in contact with a second layer of magnetic field shielding material.

Nevertheless, as mentioned above for claim 1, patent '626 discloses in figure 2 a heat spreader 32, which is in contact with semiconductor chip 22 to shield the chip from EM radiation. For the same reason, patent '886 discloses in figure 1 a chip package 8 wherein the semiconductor chip (no number) is in contact with heat sink 14. And, patent '598 discloses in figures 1-4 and respective portions of the specification a wiring board/chip carrier package wherein printed circuit board 1 includes metal foil 6, adhesive 5, insulating substrate 2, adhesive 5, and metal foil 6 for heat releasing and magnetic shielding (column 2, lines 3-7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings disclosed by patent '626 or patent '886 and patent '598 into the conventional flip-chip device. One would have been motivated to make such a modification in view of the suggestion in patent '626 or patent '886 that a metal layer in

contact with a die/semiconductor chip could protect the die/chip from external electromagnetic radiation and in view of patent '598 that one or two layers of metal foil interlaminated with adhesive and insulating layers could also shield the die/chip from stray electromagnetic radiation. Thus the device is hereinafter called the proposed '886/598 flip-chip structure.

With respect to claims 21 and 22 and claims 72-74 and 76, the proposed '886/598 flip-chip structure as described above for claim 20 and the method for claim 71, wherein said die carrier/printed circuit board comprises a layer of magnetic field shielding material on an upper surface of said printed circuit board and a layer of magnetic field shielding material on a bottom surface of said printed circuit board (see figure 1, patent '598).

With respect to claim 65, the proposed '886/598 flip-chip structure as described above for claim 64, wherein said die carrier/wiring board comprises a third layer of magnetic field shielding material.

5. Claims 3-8, 13-18, 23-31, 33-38, 66-69, 75, 79-80, and 82-86 are rejected under 35 U.S.C. §103(a) as being unpatentable over prior art (figures 1 and 2 of the present application) in view of Wang et al. U.S. Patent 5,977,626 (patent '626) or Cassarly et al. U.S. Patent 4,433,886 (patent '886) and further in view of Higuchi et al. U.S. Patent 4,835,598 (patent '598), as applied above, and further in view of Kubo U.S. Patent 5,307,100.

Referring to claims 3-8, 13-14, 24, 33-34, 66-67, 79-80, and 83-84, the proposed '886/598 flip-chip structure as described above for claims 1, 12, 20, 32, 65, 70, and 71 fails to teach that shielding material comprises a magnetic material selected from the group consisting of ferrites and Metal/Ferrite/Oxide. Instead, the combined teachings disclose copper or aluminum.

On the other hand, Kubo shows in figure 7 an electromagnetic shield plate 55 made of copper, aluminum, ferrite, or the like (column 6, lines 50-55), thereby teaching that copper and aluminum server as magnetic shielding materials just as ferrite. Furthermore, it would have been an obvious design choice to use a metal/ferrite/oxide material as a magnetic shielding material.

With respect to claims 15-18, 23, 25-31, 35-38, 68-69, 75, 81-82, and 85-86, in order to provide a suitable intended use and end means in the claimed integrated circuit structure and method, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select known available materials and technologically feasible sizes, shapes, and designs as recited in these claims.

6. Applicant's arguments with respect to claims 1-40 and 64-86, filed 05 August 2002, have been fully considered but they are not persuasive.

With respect to Applicant's arguments on pages 4, 6, and 7 of the Remarks that Wang's heat spreader/magnetic field shielding material (32) is not a magnetic field shielding material nor is the invention directed at providing an EM shield, it is noted that not only does metal or alloy, the material for heat spreader 32 (column 3, lines 58-59), inherently possess EM shielding properties, the features are mentioned and claimed throughout the specification ("An object of the present invention is to provide a package with good efficiency of spreading heat and enhanced EM shielding.", Summary of the Invention; "The present invention discloses a structure of a semiconductor package for improving the efficiency of spreading heat and EM

shielding.”, the paragraph bridging columns 2 and 3; “The present invention features the advantage of that the ground ring 20c and the heat spreader 32 construct a electric and. magnetic (EM) shielding to suppress the EM effect.”, column 4, lines 19-22; “The present invention exhibits short signal transferring path. Further, it can improve the EM shielding effect.”, column 4, lines 25-30; and “wherein said ground ring and said heat spreader construct an electric and magnetic (EM) shielding to suppress the EM effect and reduce the I inductance impedance; column 8, claim 27).

Note also that although Wang does not label the heat spreader 32 being “a magnetic field shielding material” as claimed by Applicant nor does Wang explicitly claim “chip containing structures which may be affected by external magnetic fields”, Figures 2-7, specifically Figures 2 and 3, of Wang do not distinguish from the claimed structure. Further, the labels nonetheless are meaningless. The Wang’s structure anticipates Applicant’s claimed structure regardless of whether the layer is labeled “a magnetic field shielding material” or a claim of the chip being effected by external magnetic fields. See *In re Pearson*, 181 USPQ 642; *Fx parte Minks* 169 USPQ 120; or *In re Swinehart* 169 USPQ 226, all of which make it clear that mere “labels” or “statements of intended use” as we have here do not distinguish over Wang’s structure which may be likewise labeled.

With respect to Applicant’s arguments on pages 4-6 of the Remarks that Wang’s heat spreader is arranged over the top surface of the substrate 20, this observation is true only for the portion of the heat spreader that is arranged over the top surface of the substrate. The other portion, the main portion, is in contact with the *back* surface of the chip (*Figure 3* and column 4,

lines 10-11, “The supporting member 32c can be optionally made to contact to the chip 22 or not.”). Even the structure of *Figure 2* anticipates the claimed structure (said integrated circuit chip having a front surface and a back surface, said front surface (facing down) being *supported* by a chip carrier 20; and a magnetic field shielding material 32 in contact with said back surface (facing up) of said chip). Even if independent claims 1, 32, and 70 are amended to recite “being electrically supported”, the structure of *Figure 3* would anticipate the amended limitation.

Applicant argues on page 6 of the Remark that there is no motivation to combine Wang and Applicant’s Figures 1 and 2. The argument is not persuasive. As noted above, Wang teaches a heat spreader that also functions as a magnetic field shielding material layer. It is perfectly logical to combine the teachings into Applicant’s Figures 2 and 3. One would be motivated to form a heat spreader of metal or alloy on top of the IC 30 of *Figure 1* Prior Art in view of the teachings of Wang that metallized heat spreader promote thermals dissipation and EM shielding.

With respect to Applicant’s argument on page 7 of the Remarks that Higuchi’s laminated metal foil 6 is used to form an electric circuit pattern 8, the argument is found non-persuasive. In column 3, fourth paragraph, Higuchi discloses: “After inserting the thermo-conductive plate 4 into the openings 3, a metal foil laminate 6 is applied over the both upper and *lower* surfaces of the insulating substrate 2 with an insulating adhesive layer 5 interposing therebetween.” and *Figures 4, 6a, and 6b* depict that only upper layer 6 is etched to form circuit patter 8. Furthermore, metal foil layers 6 are only a part of the equation. The whole structure, the whole disclosure, specifically thermal-conductive plate 4 and metal foils 6, promotes excellent magnetic shield effect as clearly stated in Summary of the Invention: “it is the primary object of

this invention (is) to provide a wiring board as a semiconductor chip carrier which displays excellent heat releasing capability *and magnetic shield effect* in addition to electric insulation.”. Applicant states: Higuchi’s device may experience better magnetic shielding properties; but, this is not a direct result of applying a magnetic shielding material” (Remarks, page 7) and “Wang discloses a structure that provides slightly improved EM shielding benefits; however, Wang’s heat spreader 32 is not a magnetic field shielding material nor is the invention directed at providing an EM shield” (Remarks, page 4). This is found to be not objective. Again, although both Wang and Higuchi do not label their layers “magnetic field shielding material”, their layers function as claimed and thus anticipate the claims, as noted above.

With respect to the argument on page 8 of the Remarks that the cited combination of references does not render Applicant’s invention obvious, the facts state otherwise. Wang teaches an integrated circuit structure comprising a die/IC/chip 22 connected to a die/IC/chip carrier 20, the die/IC/chip 22 in contact with a first layer of magnetic field shielding material/heat spreader 32; Wang a chip carrier and a ground ring/third magnetic field shielding material 20c (column 4, second paragraph), and Cassarly a metal ground shield/third field shielding material which encases the housing / connector mounting / die/IC/chip connector and with which the clamp member is engaged (Abstract) (again, material use/label, and statement of intended use – or lack of it); and Higuchi a wiring board/printed circuit board with a second magnetic field shield material (wherein the second magnetic field shielding material layer may be on a top surface, a bottom surface, side surfaces, or in the middle of the wiring board/printed circuit board, and could be labeled second, fourth, and fifth layer of magnetic field shielding material).

The argument by Applicant on page 9 of the Remark that the Office Action's reliance on Kubo is misplaced is not entirely persuasive. It is well known in the art that metals and their alloys and materials containing metal particles exhibit some degree of magnetic shielding properties. The Office Action cites Kubo and the material use to conform to a recent PTO requirement that common knowledge/design choice/material usage statements in Office Actions alone are not persuasive enough on some occasions.

7. Applicant's amendments to independent claims 32 and 70 have necessitated new grounds of rejection for claims 32-40 and 70-86. See MPEP § 706.07(a).
8. Claims 32 and 70 are rejected under 35 U.S.C. §102(e) as being anticipated by Tao et al. U.S. Patent 6,191,360.

The figures and reference numbers referred to in this Office Action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Referring to claim 32, Tao et al. disclose in Figures 1-11, specifically Figure 7, and respective portions of the specification an integrated circuit chip containing structures which may be affected by external magnetic fields, said chip comprising a magnetic field shielding material 56 in contact with a surface of said chip, wherein said surface is a back surface of the chip.

Note that although Tao et al. do not explicitly label layer 56 a magnetic field shielding material, the structure functions as claimed ("The secondary object of this invention is to provide a thermally enhanced BGA package, which comprises a heat spreader shielding Electro Magnetic Interference (EMI) to a chip").

Referring to claim 70, Tao et al. disclose in Figures 1-11, specifically Figure 7, and respective portions of the specification a method of packaging a semiconductor device comprising:

electrically coupling a die carrier 50 to a first surface (the active surface) of a die, said first surface being opposite to a second surface of said die; and

contacting said second surface of said die with a first layer of magnetic field shielding material 56 which shields said die from external magnetic fields, wherein said second surface is a back surface of the die.

Similarly as noted above, although Tao et al. do not explicitly label layer 56 a magnetic field shielding material, the structure functions as claimed.

9. Claims 32-40 and 70 are rejected under 35 U.S.C. §102(b) as being anticipated by Maheshwari et al. U.S. Patent 5,811,317.

Referring to claim 32, Maheshwari et al. disclose in Figures 1-6, specifically Figure 6, and respective portions of the specification an integrated circuit chip containing structures which may be affected by external magnetic fields, said chip comprising a magnetic field shielding material/balance plate/heat sink in contact with a surface of said chip, wherein said surface is a back surface of the chip.

Note that although Maheshwari et al. do not explicitly label balance plate a magnetic field shielding material, the structure functions as claimed since the balance plate is formed of copper or other comparable material (Summary of the Invention), and as noted above that metal and materials containing metal particles exhibit some degree of magnetic shielding properties.

Referring to claim 70, Maheshwari et al. disclose in Figures 1-6, specifically Figure 6, and respective portions of the specification a method of packaging a semiconductor device comprising:

electrically coupling a die carrier Substrate to a first surface (the active surface) of a die, said first surface being opposite to a second surface of said die; and

contacting said second surface of said die with a first layer of magnetic field shielding material Balance Plate which shields said die from external magnetic fields, wherein said second surface is a back surface of the die.

Similarly as noted above, although Tao et al. do not explicitly label balance plate a magnetic field shielding material, the structure functions as claimed.

Referring to claims 33-40, Both Tao et al. and Maheshwari et al. fail to explicitly disclose all possible materials used for electromagnetic shielding/thermal dissipation as claimed in these claims. However, as noted above in paragraph 6, these materials are well known in the art at the time the invention was made.

10. Claims 71-86 are rejected under 35 U.S.C. §103(a) as being unpatentable over Tao et al. or Maheshwari et al. in view of Brown U.S. Patent 5,789,142.

Referring to claim 71, Both Tao et al. and Maheshwari et al. disclose a structure and method as claimed in claim 70 but fail to disclose a printed circuit board comprising a magnetic field shielding material. Note also that although both seem to explicitly disclose even a printed circuit board, a printed circuit board is required for their structures to function. Brown teaches a method for, among other things, forming electromagnetic shield layers within a multilayer circuit

board (Abstract). In addition, Brown also discloses that printed circuit boards could be used for flip-chip structures (Background of the Invention). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form electromagnetic shield layers within a multilayer circuit board for the explicit benefits of shielding electromagnetic fields. One would have been motivated to electrically couple the die carrier taught by either Tao et al. or Maheshwari et al. to a printed circuit board having electromagnetic shield layers for shielding electromagnetic fields.

Referring to claims 72-86, Both Tao et al. and Maheshwari et al. fail to explicitly disclose all possible materials used for electromagnetic shielding/thermal dissipation as claimed in these claims. However, as noted above in paragraph 6, these materials are well known in the art at the time the invention was made.

11. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- U.S. Patent 5,371,404 and 5,783,857 disclose various structures having radio frequency/microwave shielding properties using a thermally and electrically conductive plastic material containing metal particles.

- U.S. Patent 6,104,610 discloses an EMI shielding fluid control apparatus.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (703) 305-0086. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (703) 308-4910. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.



Tu-Tu Ho
August 13, 2002



David Nelms
Supervisory Patent Examiner
Technology Center 2800